USPS-T-28

BEFORE THE
POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268-0001

POSTAL RATE AND FEE CHANGES, 2000

Docket No. R2000-1

DIRECT TESTIMONY
OF
SHARON DANIEL
ON BEHALF OF
UNITED STATES POSTAL SERVICE

LIST OF TABLES

LIST OF LIBRARY REFERENCES

USPS LR-I-91:	First-Class Mail Weight Studies
USPS LR-I-92:	Standard Mail (A) Weight Studies
USPS LR-I-93:	Periodicals Weight Studies
USPS LR-I-94:	Supporting Calculations for Weight Studies
USPS LR-I-95:	Development of Delivery Costs by Rate Category for First-Class Mail and Standard Mail (A)
USPS LR-I-96:	Development of ECR and NPECR Mail Processing Saturation Savings
USPS LR-I-97:	Development of Roll Forward Final Adjustments
USPS LR-I-98:	Underlying Cost Models for Roll Forward Final Adjustments
USPS LR-I-99:	Underlying Mail Processing and Window Cost Data for Weight Studies
USPS LR-I-100:	Underlying Cost Data for Delivery Studies (ECR and Weight)
USPS LR-I-101:	Underlying Cost Data for ECR Mail Processing Studies
USPS LR-I-102:	First-Class Mail, Standard Mail (A), and Periodicals Volumes by Shape and Ounce Increment
USPS LR-I-173:	Rural Carrier Costing System New Methodology Evaluation

Direct Testimony

of

Sharon Daniel

AUTOBIOGRAPHICAL SKETCH

My name is Sharon Daniel. I am an Operations Research Analyst in Special Studies, Activity-Based Management, Finance. I have worked at Postal Service Headquarters since 1995. Prior to joining the Postal Service, I was a consultant with Price Waterhouse and worked in the Center for Postal Consulting. While at Price Waterhouse, I supported many of the Postal Service witnesses in Docket No. MC95-1. After joining the Postal Service, I provided testimony in Docket No. MC96-2 on Standard Mail (A) Nonprofit letter mail processing costs. In Docket No. R97-1, I testified to various Standard Mail (A) letter and Standard Mail (B) Parcel Post mail processing costs (USPS-T-29). I also provided supplemental testimony (USPS-ST-43) in Docket No. R97-1 on the additional mail processing and delivery cost of nonstandard First-Class Mail pieces.

I have spent considerable time observing mail processing in Processing and Distribution Centers (P&DCs), Bulk Mail Centers (BMCs), and carrier stations. I have also consulted extensively on various operational and cost matters with postal headquarters and field personnel. I earned a Bachelor of Science Degree in Mathematics and a Master of Science Degree in Operations Research from the College of William and Mary in 1991 and 1992, respectively.

I. PURPOSE OF TESTIMONY

The purpose of this testimony is to:

- *Analyze the relationship between weight and cost to support rate design in First-Class, Standard Mail (A), and Periodicals.*
  The cost estimates by weight increment developed in this testimony are designed to give USPS pricing witnesses Fronk (USPS-T-33), Moeller (USPS-T-35), and Taufique (USPS-T-38) a general indication of how costs are influenced by weight.
- *Estimate delivery costs by rate category in Standard Mail (A) and First-Class Mail Presort.*
  Delivery cost differences caused by shape, delivery point sequencing (DPS), and high density and saturation presorting calculated in this testimony are used to develop delivery costs by rate category. These delivery costs for Standard Mail (A) and First-Class Mail are combined with corresponding mail processing costs developed in this testimony and by witnesses Miller (USPS-T-24) and Yacobucci (USPS-T-25) and are used by USPS pricing witnesses Moeller (USPS-T-35) and Fronk (USPS-T-33) for Standard Mail (A) and First-Class Mail rate design.
- *Estimate the mail processing costs for Enhanced Carrier Route (ECR) and Nonprofit Enhanced Carrier Route (NPECR) rate categories.*
  Test Year (TY) mail processing savings for Walk Sequenced Saturation/High Density versus Basic rate categories in ECR and NPECR are developed in this testimony. These costs are combined with corresponding delivery costs and are used by USPS pricing witnesses Moeller (USPS-T-35) and Taufique (USPS-T-38).
- *Discuss the cost of Special Handling.*
  This testimony describes how Special Handling costs are developed in the Cost and Revenue Analysis Report (CRA) and describes field observations. This qualitative analysis informs witness Mayo's (USPS-T-39) approach to Special Handling in her testimony.
- *Calculate Roll Forward Final Adjustments.*
  Finally, this testimony estimates the Roll Forward Final Adjustments due to changing volume mixes from the Base Year (BY) to the TY. These final adjustments appear

in the D-Report of USPS witness Kashani's testimony (USPS-T-14) and in USPS witnesses Tayman's (USPS-T-9) and Kay's (USPS-T-23) workpapers.

II. SUMMARY OF TESTIMONY

This testimony is organized around the subject matter areas discussed above. Specifically, Section III of this testimony broadly explains the approach used to assess the impact of weight on costs, while Section IV discusses the detailed methodology used to develop TY unit costs by weight increment for each major cost segment. Tables 1-4 in Sections V through VII present the results of the relationship between weight and cost in First-Class Mail, Standard Mail (A), and Periodicals. These results are developed by subclass in USPS LR-I-91 through USPS LR-I-93.

Section VIII discusses the development of TY delivery costs (City In-Office, Street, and Rural) for rate categories in First-Class Mail and Standard Mail (A) Regular, Nonprofit, ECR, and NPECR. These results are developed by subclass in USPS LR-I-95 and are summarized in Table 5.

Section IX discusses the methodology and adjustments made for estimating the TY mail processing savings for Walk Sequenced Saturation/High Density versus Basic rate categories in ECR and NPECR. The costs and adjustments to remove the effects of dropshipping are found in USPS LR-I-96 and are summarized in Table 6. These costs are combined with delivery costs and are summarized in Table 7.

Section X analyzes Special Handling costs in the CRA and describes field observations.

Section XI discusses the calculations used to determine various roll forward final adjustments that are summarized in Table 8. The cost of mail shifting between Priority Mail and First-Class Mail Single-Piece as a result of the change in the weight break point from 11 to 13 ounces since the conclusion of the Base Year is estimated in USPS LR-I-97. The estimation of additional costs of heavier mail migrating to First-Class Mail Single-Piece due to the elimination of Standard Mail (A) Single Piece and because of the trend in increasing weight per piece is also found in USPS LR-I-97. Finally, how the average costs of First-Class Mail Presort Letter and Parcels, First-Class Mail Presort Cards, Standard Mail (A) Regular, ECR, Nonprofit, and NPECR, and Standard Mail (B)

Parcel Post are affected by changes in the mail volume mix from the BY to TY is calculated in USPS LR-I-97.

As discussed above, this testimony draws from USPS LR-I-91 through USPS LR-I-102. These library references were prepared by me or under my supervision and are closely associated with, and described throughout, my testimony. This study also relies on data from Table 2 in USPS LR-I-173 that is used to crosswalk rural compensation categories to Domestic Mail Manual (DMM)-defined shape categories.

III. GENERAL APPROACH FOR ASSESSING IMPACT OF WEIGHT ON COSTS

This testimony provides an overview of the impact of weight on Test Year unit costs for First-Class Mail, Standard Mail (A) and Periodicals. The results, which are presented in Tables 1 through 3, were derived by analyzing subclass volume-variable costs in the mail processing, window service, delivery, transportation, vehicle service and "other" cost components individually by shape and in total over all shapes. In general, the results show increasing weight results in higher total unit cost of handling mail, especially since the proportion of flats and parcels increase in heavier weight increments. In general, although the cost of handling letters tends to increase as weight increases, the costs of handling flats and parcels do not appear to increase as weight increases in the lighter weight increments, but do tend to increase in heavier weight increments.

The results of the weight analysis presented in this testimony are intended to guide rate design by providing a *general* indication of the effect weight has on total volume variable costs. They are not necessarily intended to be an *exact* quantification of costs for every individual weight increment. Isolating the effect of weight on cost is very difficult because weight is rarely the only characteristic that varies between different mail pieces. The shape, origin/destination combination, cube, and level of presorting and dropshipping of mail can affect the cost of mail. In general, shape changes from mostly letters to mostly flats and parcels as weight increases. Cube also tends to be proportional to weight, especially for paper-based products like letters and flats. Origin and destination pairs may be different for pieces of various weights. Other cost drivers such as the level of presorting, customer barcoding, dropshipping, and mail preparation

vary across weight increments. Some volume data exist to quantify the mix of different shapes and worksharing levels at each ounce increment and are presented in USPS LR-I-102. However, data do not exist to control for differences in origin/destination combinations or mail preparation. Thus, while it is possible to analyze the data for guidance in rate design, it is difficult, if not impossible, to isolate precisely the impact of weight on costs or identify the exact unit cost of each ounce increment for three of the major classes of mail.

The methodology used here involves every major cost component. Test Year costs such as transportation and street delivery are allocated to weight increment and shape using distribution keys consistent with the Base Year methodology presented in USPS witness Meehan's testimony (USPS-T-11). Test Year mail processing, window service, and city carrier in-office costs are allocated to weight increment and shape using data from the In-Office Cost System (IOCS) tallies. The methodology used to distribute mail processing volume-variable cost to weight increment uses new distribution techniques to improve upon the methodology employed by Postal Service witness McGrane in Docket Nos. MC95-1 and R97-1 for Standard Mail (A) and witness Madison in Docket No. R84-1 for Periodicals.

The use of IOCS tallies to study the impact of weight on costs has been the subject of some debate. Some have suggested that more insight might be gained from engineering-type studies. An IOCS-based analysis, however, is adopted here because the IOCS samples employees in all mail processing and carrier in-office operations around the clock, 24 hours per day, 7 days per week. This system provides a much more extensive set of data derived from actual Postal Service operations than any one-time engineering or field study could provide. Though IOCS was not specifically designed for the purpose of measuring the impact of weight on costs, data collectors record, among other things, the weight of mail pieces handled by sampled employees. Though data are recorded by half-ounce increment, up to four ounces, combining weight increments produces more reliable estimates and compensates for the sparsity of data especially in heavier weight increments.

The percent of direct tallies that are derived from tallies where weight is recorded are generally the same by subclass and shape, but vary by cost pool.[1] Most of the direct tallies, in operations like manual letter sorting or flats sorting machines, have weight recorded. Tallies where weight is not known are distributed in a similar manner as USPS witness Van-Ty-Smith (UPS-T-17) distributes mixed-mail tallies where the subclass is not known. This approach uses information where weight is known within a cost pool, activity code, or subclass to distribute tallies where weight is not known. This represents an improvement over previous methodologies that distributed costs for mail with unknown weight based on the aggregate costs where weight was known. Using the CRA methodology is also superior to allocating costs where weight is not known totally on the basis of weight or piece volumes alone.

IV. DETAILED METHODOLOGY BY COST SEGMENT FOR ALLOCATING COSTS TO WEIGHT INCREMENTS

A. Mail Processing

1. Cost Segment 3.1 Base Year Tally Analysis

Calculating mail processing costs by weight increment begins with data from the BY IOCS files. Base Year IOCS mail processing tallies are analyzed in the same manner as employed by USPS witness Van-Ty-Smith (USPS-T-17) to produce costs by shape. An extra step is added to the computer programs to develop cost distribution keys by weight increment (as well as by shape, subclass and cost pool). The programs and output for MODS facilities, Non-MODS facilities, and BMCs are found in USPS LR-I-99, Underlying Mail Processing and Window Cost Data for Weight Studies. The results do not exactly match witness Smith's inputs due to rounding differences.

2. Conversion to Reconciled Test Year Piggybacked Costs

Base Year direct labor mail processing costs need to be converted to Test Year costs and piggybacked to include indirect costs such as supervisor and facility space costs. The methodology used in USPS LR-I-94, Supporting Calculations for Weight Studies, to convert the Base Year data found in USPS LR-I-99 to Test Year

[1] Direct tally data can be found in USPS LR-I-99, Underlying Mail Processing and Window Cost Data for Weight Studies.

piggybacked data, is the same as that used by USPS witness Smith (USPS-T-21) to produce Test Year piggybacked costs by shape. The process is as follows: the raw data are multiplied by a reconciliation factor[2] by class and another adjustment[3] by cost pool. This product is then multiplied by the sum of the class-specific premium pay factor and the cost pool-specific piggyback factor minus one. The resulting total test year costs by ounce increment are sorted by subclass and shape for each type of facility. The sum of costs across all cost pools by shape and ounce increment is found on the mail processing (MP) page of each subclass file shown in the weight studies library references USPS LR-I-91 through LR-I-93.

B. Window Service

1. Cost Segment 3.2 Base Year Tally Analysis

Calculating window service costs by weight increment begins with data from the BY IOCS files. Base year window service costs by weight increment, shape, and subclass are developed using FORTRAN programs replicating witness Van-Ty-Smith's window service ADMWIN SAS programs that computes window service "direct labor" costs by subclass (see USPS-T-17 and USPS-LR-I-106). As with mail processing costs, witness Van-Ty-Smith's methods are extended to additionally compute distribution keys by weight increment. Weight increments are assigned in exactly the same manner as they were for mail processing costs. The documented program and output are found in USPS LR-I-99, Underlying Mail Processing and Window Cost Data for Weight Studies.

2. Conversion to Reconciled Test Year Piggybacked Costs

Base Year direct labor window service costs need to be converted to TY costs and piggybacked to include indirect costs such as supervisor and facility space costs. Total BY window service costs by subclass are compared to TY window service costs produced by USPS witness Kashani (USPS-T-14) to calculate a TY/BY ratio. Base year costs by shape and weight increment are multiplied by this ratio in each subclass file on the "TY Window" worksheet as shown in the weight studies library references USPS LR-I-91 through LR-I-93. The direct labor TY costs for each subclass are

---

[2] The reconciliation factor is the product of two separate reconciliations witness Smith (USPS-T-21) makes to compensate for approximations of calculations done by witnesses Meehan and Kashani. As a result, costs must then be reconciled back to BY and TY costs to be consistent at the subclass level.

multiplied by the appropriate subclass-specific, window service piggyback factor calculated by USPS witness Smith (USPS-T-21) Attachment 11.

C. Delivery

1. Cost Segment 6.1 Base Year In-Office Tally Analysis

Calculating city carrier in-office costs by weight increment begins with data from the BY IOCS files. Base year city carrier in-office costs by weight increment, shape, and subclass, were developed using FORTRAN programs which replicate the LIOCATT cost distribution method.[4] A more detailed explanation of this procedure along with the documented programs and output are found in USPS LR-I-100, Underlying Cost Data for Delivery Studies (ECR and Weight).

2. Conversion to Reconciled Test Year Piggybacked Costs

Next, BY direct labor city carrier in-office costs need to be converted to TY costs and piggybacked to include indirect costs such as supervisor and facility space costs. Total BY city delivery in-office costs by subclass are compared to TY city in-office costs provided by USPS witness Kashani (USPS-T-14) to calculate a TY/BY ratio. Base year costs by shape and weight increment are multiplied by the appropriate ratio for each shape in each subclass file on the "TY City" worksheet as shown in the weight studies library references USPS LR-I-91 through LR-I-93. The direct labor reconciled TY costs for each subclass are multiplied by the appropriate subclass-specific, city carrier piggyback factor calculated by USPS witness Smith (USPS-T-21) Attachment 11.

3. Cost Segment 6.2 Test Year Piggybacked Cost Distribution

USPS witness Kashani (USPS-T-14) provides TY in-office delivery support costs (C/S 6.2). These costs need to be piggybacked to reflect indirect costs using the appropriate subclass-specific, city carrier piggyback factor calculated by USPS witness Smith (USPS-T-21) Attachment 11. These costs are distributed to weight increment in proportion to costs developed in cost segment 6.1 described above. This calculation

---

[3] Witness Smith (USPS-T-21) uses the adjustment factor by cost pool to reflect the impact of cost reduction programs in the test year.

[4] Due to the programming differences between COBOL and FORTRAN and subtle changes made to the LIOCATT process since Docket No. R97-1, the results produced in this library reference do not exactly match the results in witness Ramage's testimony (USPS-T-2) WP.A. This is dealt with in USPS LR-I-95 by tying to the results in witness Ramage's testimony.

can be found for each subclass in the weight studies library references USPS LR-I-91 through LR-I-93.

4. Cost Segment 7 Test Year Piggybacked Cost Distribution

USPS witness Kashani (USPS-T-14) provides TY city carrier street labor costs in cost segments 7.1 through 7.4. These costs need to be piggybacked to reflect indirect costs using the appropriate subclass-specific, city carrier piggyback factor calculated in USPS witness Smith's (USPS-T-21) Attachment 11. TY piggybacked costs are then analyzed by component to determine if they vary by weight. The distribution of city street delivery costs can be found for each subclass in the weight studies library references USPS LR-I-91 through LR-I-93.

Costs in segment 7.1, Route Time, correspond to the time spent by the carrier traversing the course of the route without deviating to make stops. This time should not vary significantly by weight and therefore these costs are distributed on the basis of piece. Costs in segment 7.2, Access Time, includes carrier walking time spent in deviating from the course of a route to go to and from customer delivery sites and collection boxes, and driving time associated with slowing to serve curbline boxes or deviating to serve collection boxes. These costs should not vary significantly by weight and are therefore distributed on the basis of pieces.

Costs in segment 7.3, Elemental load, include the time spent handling mail pieces at the point of delivery such as putting mail into a receptacle. Previous studies show that shape is a driver in the amount of elemental load cost. A distribution key is calculated in USPS LR-I-95, Development of Delivery Costs by Rate Category for Standard Mail (A) and First-Class Mail Presort, and described in Section VII of this testimony. This key is used to distribute elemental load costs to shape.

Since flats and parcels cost more to load than letters, and flats and parcels are heavier on average than letters, it seems reasonable that heavier pieces of the same shape may cost more to load than lighter pieces of the same shape. However, if weight is used as a distribution key, costs will double as weight doubles. This is not necessarily the case for load time, but using weight as a key compensates for any weight-related effects in route and access time, which have been allocated on the basis of piece. Therefore, costs for the elemental load portion of street delivery costs are

allocated on the basis of weight within shape instead of on the basis of pieces as was done by USPS witness McGrane Docket No. R97-1.

Finally, costs in segment 7.4, street support, are distributed to weight increment in proportion to the sum of costs in cost segments 6.1 through 7.3 as developed above. This distribution is consistent with the distribution of cost in the USPS witness Meehan's Base Year testimony (USPS-T-11).

5. Cost Segment 10 Test Year Piggybacked Cost Distribution

USPS witness Kashani (USPS-T-14) provides TY rural carrier labor costs in cost segment 10. These costs need to be piggybacked to reflect indirect costs using the appropriate subclass-specific, rural piggyback factor calculated in USPS witness Smith's (USPS-T-21) Attachment 11. A distribution key is developed in USPS LR-I-95 and discussed in Section VIII of my testimony. Since rural carriers are compensated on the basis of shape and not weight, costs are first distributed to shape and then to weight increment on the basis of pieces.

D. Cost Segment 8 Vehicle Service Test Year Piggybacked Cost Distribution

USPS witness Kashani (USPS-T-14) provides TY vehicle service costs in cost segment 8. These costs need to be piggybacked to reflect indirect costs using the appropriate subclass-specific, rural piggyback factor calculated in USPS witness Smith's (USPS-T-21) Attachment 11. These TY piggybacked costs are distributed on basis of cube. This testimony uses the pounds per cubic feet, or density factors, by shape from Docket No. MC95-1 to estimate cube.

E. Cost Segment 14 Transportation Test Year Costs

1. Air/Water Cost Distribution

USPS witness Kashani (USPS-T-14) provides TY air and water transportation costs in cost segment 14. Consistent with witness Meehan's BY methodology, these costs are distributed on the basis of weight. No piggybacks are required.

2. Highway/Rail Cost Distribution

USPS witness Kashani (USPS-T-14) also provides TY highway and rail transportation costs in cost segment 14. Consistent with witness Meehan's BY methodology, these costs are distributed on the basis of cube. This testimony uses the

pounds per cubic feet, or density factors, by shape from Docket No. MC95-1 to estimate cube. No piggybacks are required.

F. "Other" Test Year Costs

The difference between total CRA costs and the piggyback costs of the components discussed above are called "Other" costs. These cost primarily consist of Postmaster costs (Cost Segment 1) and miscellaneous costs in other cost segments that are not piggybacked on clerk, carrier or vehicle service driver costs. These "Other" costs are distributed on the basis of weight.

G. Development of Volumes and Pounds by Weight Increments

The development of Base Year volumes and weight by subclass, shape and ounce increment is discussed in USPS LR-I-102. Base Year volumes are compared to TY forecasted volumes to develop a ratio at the subclass level in each of the weight studies found in USPS LR-I-91 through LR-I-93. This ratio is then applied to BY volumes and pounds by weight increment.

V. RESULTS OF IMPACT OF WEIGHT ON FIRST-CLASS COSTS

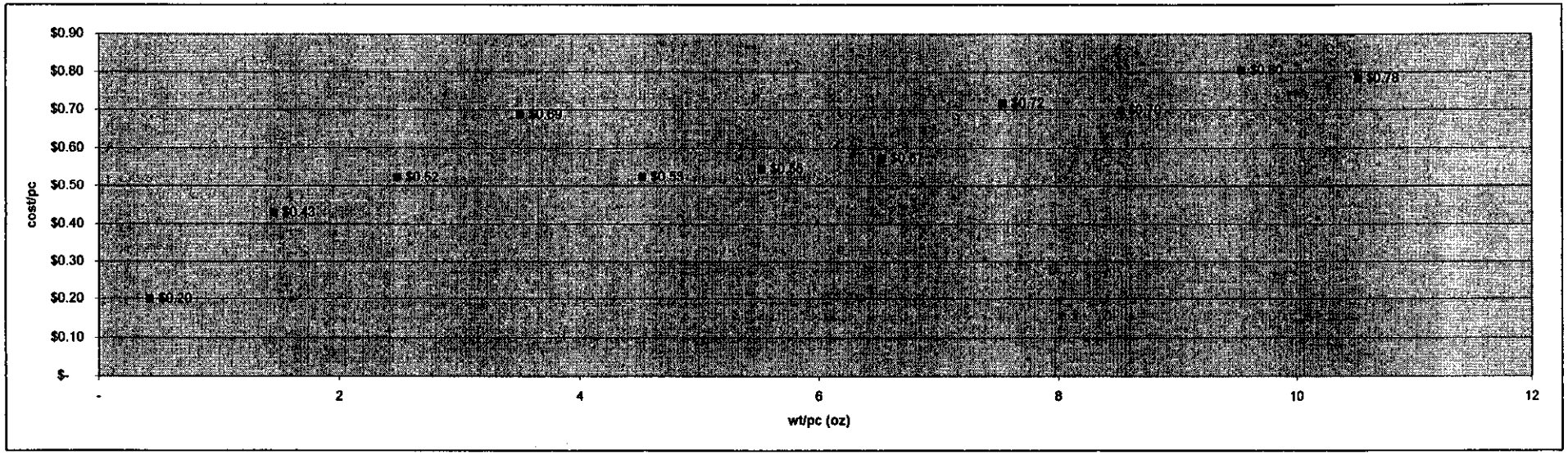
A. First-Class Single-Piece

Using the inputs described in the previous section, TY unit costs by weight increment were estimated. A table of TY costs by ounce increment for First-Class Mail Single-Piece is shown in Table 1. Since there are no shape-based rates or weight-based worksharing discounts available in First-Class Mail Single-Piece, it is appropriate to look total unit costs by full-ounce increment, aggregated over all shapes. Most of the pieces subject to the additional ounce rate weigh less than four ounces (78 percent) where unit costs increase the most as weight increases. The total costs for pieces in excess of the first ounce cost are divided these by "postage ounces," i.e., the total number of additional ounces purchased.[5] This results in an average cost of 12.5 cents for each additional postage ounce. Witness Fronk (USPS-T-33) uses this as a basis for his additional ounce rate design.

[5] This is different from the actual number of additional ounces because weight is rounded up to the next ounce in calculating rates.

USPS-T-28 Table 1:
Costs by Ounce Increment for First-Class Single-Piece
(from USPS LR-I-91 detailed costs)

	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11+	Total
volume	45,916,891,588	3,537,561,922	1,411,655,462	760,369,038	495,995,087	335,279,116	239,491,425	180,013,025	142,120,261	113,135,720	81,315,727	53,213,828,371
pounds	1,199,693,891	319,644,452	218,606,963	166,452,703	140,079,051	115,654,251	97,681,167	84,755,922	75,817,970	67,425,946	53,505,549	2,539,317,868
cubic feet (weight/density)	53,844,510	17,344,475	13,526,668	11,015,252	9,736,229	8,211,615	7,121,765	6,320,067	5,835,586	5,236,389	4,251,242	142,443,798
all mp (3.1) tally	5,688,966	1,046,407	506,122	357,547	143,170	94,341	65,956	65,005	42,948	42,304	23,260	8,076,026
window service (3.2) tally	716,028	49,149	19,864	15,205	7,834	5,013	3,169	2,452	2,207	1,878	2,459	825,257
delivery in-office (6.1) tally	1,071,699	115,867	40,767	27,972	12,610	7,091	4,231	4,781	3,189	1,949	1,751	1,291,907
delivery in-office (6.2) 6.1	264,956	28,646	10,079	6,916	3,118	1,753	1,046	1,182	788	482	433	319,398
del. route (7.1) piece	17,591	1,355	541	291	190	128	92	69	54	43	31	20,386
del. access (7.2) piece	85,486	6,586	2,628	1,416	923	624	446	335	265	211	151	99,072
elem. load (7.3)shape&wt	320,417	54,713	25,684	16,051	13,277	10,757	9,594	8,704	8,625	7,856	6,627	482,303
del. support (7.4) sum6&7	325,920	38,914	15,176	9,968	5,886	4,055	3,131	3,028	2,645	2,193	1,866	412,779
vehicle service (8) cube	18,253	5,880	4,585	3,734	3,301	2,784	2,414	2,142	1,978	1,775	1,441	48,288
delivery rural (10)shape&pc	316,579	33,029	15,881	9,274	6,333	4,370	3,182	2,433	1,960	1,570	1,146	395,757
air/water trans. (14) weight	127,790	34,048	23,286	17,730	14,921	12,319	10,405	9,028	8,076	7,182	5,699	270,486
hwy/rail trans. (14)cube	101,851	32,808	25,587	20,836	18,417	15,533	13,471	11,955	11,038	9,905	8,042	269,443
Other weight	229,381	61,116	41,798	31,826	26,783	22,113	18,677	16,205	14,496	12,892	10,230	485,516
Total Cost	9,284,918	1,508,518	731,997	518,766	256,761	180,881	135,813	127,320	98,269	90,239	63,136	12,996,617
Total Unit Cost	$ 0.202	$ 0.426	$ 0.519	$ 0.682	$ 0.518	$ 0.539	$ 0.567	$ 0.707	$ 0.691	$ 0.798	$ 0.776	$ 0.244
number of additional ounces purchased		1	2	3	4	5	6	7	8	9	10	
total number of additional ounces purchased		3,537,561,922	2,823,310,924	2,281,107,113	1,983,980,348	1,676,395,580	1,436,948,548	1,260,091,173	1,136,962,091	1,018,221,481	813,157,274	17,967,736,454
cost of pieces in excess of first ounce cost		$ 793,182,254	$ 446,544,444	$ 365,010,441	$ 156,465,119	$ 113,084,195	$ 87,385,281	$ 90,918,881	$ 69,530,463	$ 67,361,550	$ 46,692,851	$ 2,236,175,478
												0.1245
Marginal Cost Difference		$ 0.224	$ 0.092	$ 0.164	$ (0.165)	$ 0.022	$ 0.028	$ 0.140	$ (0.016)	$ 0.106	$ (0.021)	



One of the reasons why costs increase sharply over the first few ounce increments is due to the change in the shape mix. The percent of flats and parcels in each ounce increment increases dramatically as weight increases as shown in Figure 1 below.

Figure 1: Shape Mix for First-Class Single-Piece by Ounce Increment*

Weight <	1oz	2oz	3oz	4oz	5oz	6oz	7oz	8oz	9oz	10oz	11oz
% letters	99.1	55.6	25.1	11.5	5.9	3.1	1.9	0.9	0.9	0.7	0.4
% flats	0.8	42.2	69.2	80.1	82.8	84.4	83.5	82.7	79.7	79.1	77.2
% parcels	0.1	2.2	5.7	8.4	11.6	12.6	14.6	16.5	19.4	20.2	22.3

*Supporting data can be found in USPS LR-I-102

A second reason appears to be that weight has a greater impact on letter costs than on flat and parcel costs as can be seen by looking at the costs by shape presented in USPS-LR-91. Letter costs rise over the first four ounces before leveling off for pieces over four ounces.[6] This result is consistent with the results of previous engineering studies presented in Docket No. MC95-1[7] that showed throughput on letter automation equipment declined as weight increased to 4 ounces.

The data also reveal insights into other aspects of the costs underlying the First-Class Mail rate design, such as the nonstandard surcharge. One criticism raised by participants in Docket No. R97-1 was the use of the cost of an average flat and parcel as a proxy for the cost of a one-ounce flat and parcel to support the nonstandard surcharge. Costs have been estimated by shape and ounce increment in this Docket in USPS LR-I-91.[8] An analysis of these data suggests that weight does not appear to have the same effect on the cost of most flats as it does on letters. The unit cost of Single-Piece flats weighing less than one-ounce appear to be much more costly to handle than the average flat. This may be attributed to the flimsy nature of light-weight flats, which could jam or fly off the machines, thereby requiring manual handling. For all classes, the flats unit cost curve is "u-shaped." This has been a longstanding feature of

[6] Over 99.9 percent of Single-Piece letters weigh less than 4 ounces.
[7] See Docket No. MC95-1, Responses to MMA/USPS-T2-10-12.
[8] The estimated unit cost of a Single-Piece flat weighing less than one-ounce is 94 cents. The estimated unit cost of a Single-Piece parcel weighing less than one ounce is $1.89.

the unit costs, as shown by witnesses Madison in Docket No. R84-1 and McGrane in Docket Nos. MC95-1 and R97-1. Since lightweight flats appear to be consistently more costly to handle than the average weight flat, USPS witness Miller's (USPS-T-24) use of the cost of an average weight flat as a proxy for a one-ounce flat potentially underestimates the cost premium associated with nonstandard mail.

Weight also does not appear to be as large of a cost determinant for First-Class Mail Single-Piece parcels as it is for letters. Costs do seem to rise more in the heavier ounce increments for parcels than they do for flats. The absolute level of unit costs for parcels may be less reliable than the trend due to the relatively smaller proportion of parcels, especially in the first weight increment (*i.e.,* pieces weighing one ounce or less).

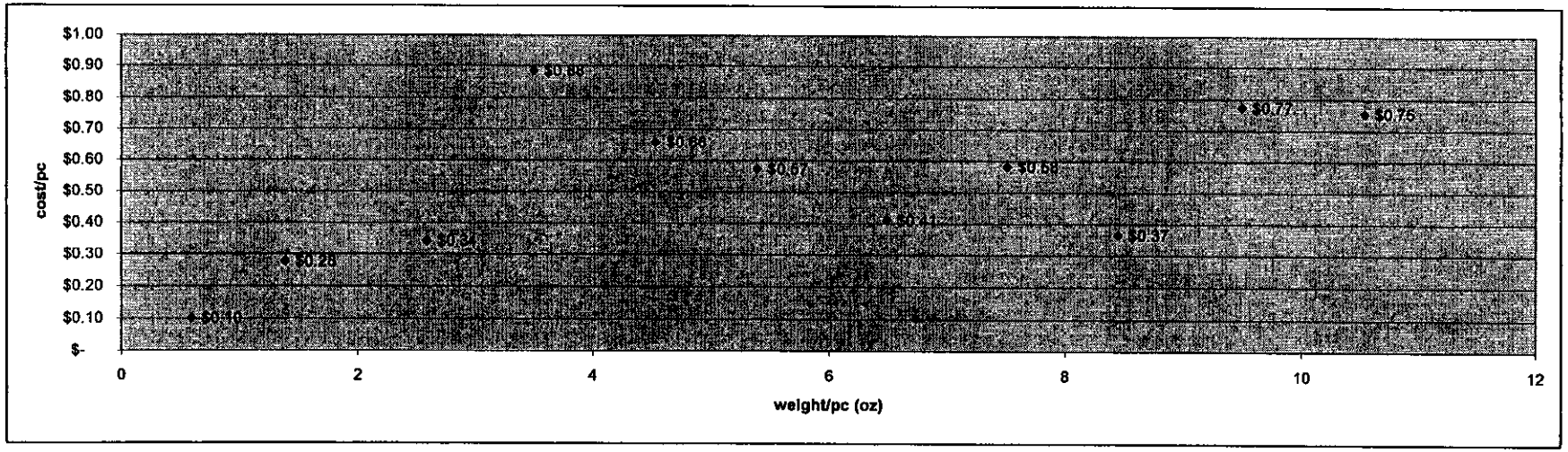
B. First-Class Mail Presort

A table of the total unit costs by ounce increment for First-Class Mail Presort is presented in Table 2. Using the approach for analyzing the data for rate design purposes described above for Single-Piece results in an average cost of 14.8 cents for each additional postage ounce. While there are 7.337 billion pieces weighing more than one ounce in First-Class Mail Single-Piece in the TY, there are only 1.649 billion pieces weighing more than one ounce in First-Class Mail Presort in the TY. The First-Class Mail Presort data therefore do not appear as stable as First-Class Mail Single-Piece data in the heavier ounce increments.

USPS-T-28 Table 2:
Costs by Ounce Increment for First-Class Presort

(from USPS LR-I-91 detailed costs)

	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11+	Total
volume	45,353,264,962	1,220,177,444	307,673,114	66,728,148	23,946,518	26,556,324	13,734,326	10,998,981	11,849,964	8,187,210	4,781,134	47,012,080,836
pounds	1,691,261,971	106,471,078	49,546,231	14,581,026	6,781,546	8,945,373	5,569,168	5,162,141	6,251,904	4,856,496	3,146,614	1,883,156,393
cubic feet (weight/density)	69,713,100	4,710,706	2,451,372	754,969	369,634	492,733	310,052	289,602	348,488	272,909	176,031	78,802,566
all mp (3.1) tally	2,100,683	191,020	63,609	45,344	10,313	9,605	2,354	2,923	1,270	3,810	1,709	2,422,927
window service (3.2) tally	38,043	1,841	204	111	377	23	13	10	11	9	126	40,613
delivery in-office (6.1) tally	606,998	45,769	8,792	4,082	1,223	1,012	519	754	201	188	238	668,395
delivery in-office (6.2) 6.1	150,368	11,338	2,178	1,011	303	251	129	187	50	47	59	165,578
del. route (7.1) piece	20,734	558	141	31	11	12	6	5	5	4	2	21,492
del. access (7.2) piece	43,574	1,172	296	64	23	26	13	11	11	8	5	45,167
elem. load (7.3)shape&wt	510,748	29,362	9,052	2,064	754	852	522	521	555	517	323	553,354
del. support (7.4) sum6&7	245,349	15,953	3,794	1,295	417	395	220	268	160	149	118	267,424
vehicle service (8) cube	28,479	1,924	1,001	308	151	201	127	118	142	111	72	32,192
delivery rural (10)shape&pc	345,572	9,770	2,696	605	227	253	132	107	114	80	46	359,257
air/water trans. (14) weight	245,435	15,451	7,190	2,116	984	1,298	808	749	907	705	457	273,282
hwy/rail trans. (14)cube	106,389	7,189	3,741	1,152	564	752	473	442	532	416	269	120,260
Other weight	100,180	6,307	2,935	864	402	530	330	306	370	288	186	111,546
Total Cost	4,542,549	337,654	105,629	59,048	15,750	15,210	5,647	6,400	4,330	6,332	3,609	5,081,486
Total Unit Cost	$ 0.100	$ 0.277	$ 0.343	$ 0.885	$ 0.658	$ 0.573	$ 0.411	$ 0.582	$ 0.365	$ 0.773	$ 0.755	$ 0.108
number of additional ounces purchased		1	2	3	4	5	6	7	8	9	10	
total number of additional ounces purchased		1,220,177,444	615,346,227	200,184,444	95,786,073	132,781,622	82,405,959	76,992,869	94,799,715	73,684,886	47,811,339	2,639,970,578
cost of pieces in excess of first ounce cost		$ 215,441,781	$ 74,812,919	$ 52,364,167	$ 13,351,330	$ 12,549,901	$ 4,271,045	$ 5,298,703	$ 3,142,754	$ 5,511,603	$ 3,130,203	$ 389,874,405
												0.1477
Marginal Cost Difference		$ 0.177	$ 0.067	$ 0.542	$ (0.227)	$ (0.085)	$ (0.162)	$ 0.171	$ (0.217)	$ 0.408	$ (0.018)	



There is a higher percentage of letters in First-Class Mail Presort, 98 percent, than in First-Class Mail Single-Piece, 91 percent, and the change in shape happens more gradually as seen in Figure 2 below. Thus, the change in costs in the first few ounce increments is not as great for Presort as it is for Single-Piece.

Figure 2: Shape Mix for First-Class Presort by Ounce Increment*

Weight <	1oz	2oz	3oz	4oz	5oz	6oz	7oz	8oz	9oz	10oz	11oz
% letters	99.8	83.5	43.8	27.2	9.5	4.4	1.4	0.6	0.3	1.0	1.6
% flats	0.2	15.8	55.7	72.4	89.6	95.0	97.6	98.0	98.9	97.2	97.0
% parcels	0.0	0.7	0.5	0.3	0.8	0.6	0.9	1.4	0.7	1.7	1.4

*Supporting data can be found in USPS LR-I-102

Because there are also relatively fewer parcels in First-Class Mail Presort versus Single-Piece, 12.4 million (.03 percent) versus 481 million (1 percent), the data for Presort parcels by ounce increment shown in USPS LR-I-91 are less reliable as absolute numbers. However, the overall pattern for Presort parcels appears to be similar to that of Single-Piece parcels.

VI. RESULTS OF IMPACT OF WEIGHT ON STANDARD MAIL (A) COSTS

The rate design for Standard Mail (A) is more complex than First-Class Mail Single-Piece. Standard Mail (A) Regular, for example, is heterogeneous with a mix of shapes in addition to various levels of presorting, barcoding and dropshipping, all of which are recognized in the rate design. The Standard Mail (A) rate structure also consists of a uniform piece rate up to the breakpoint of 3.3 ounces, then a lower piece rate plus a pound rate for mail weighing more than 3.3 ounces. There are relatively few letter-shaped pieces that weigh over 3.3 ounces, and these are considered pound rated non-letters for the purpose of rate design. The percentage of shapes is shown in Figure 3 below.

Figure 3: Shape Mix for Standard A Regular by Ounce Increment*

Weight <oz.	0-1	1-2	2-3	3-5	5-7	7-9	9-11	11-13	over 13
% letters	95.3	63.4	28.5	6.4	0.4	0.7	0.4	0.5	0.4
% flats	4.7	36.1	70.5	92.2	92.9	82.0	61.6	45.3	55.9
% parcels	0.0	0.5	1.0	1.5	6.7	17.3	37.9	54.2	43.6

*Supporting data can be found in USPS LR-I-102

Since the IOCS weight data do not allow costs to be calculated exactly at the breakpoint used in rate design (*i.e.*, 3.3 ounces), either the average cost of pieces above and below 3.0 or 3.5 ounces can be used to proxy for the cost of pound-rated and piece-rated mail. The estimated TY unit costs for piece-rated and pound-rated mail for all shapes and subclasses in Standard Mail (A) is shown in Table 3 on the next page. The costs in this table were developed using the detailed data found in USPS LR-I-92. USPS witness Moeller (USPS-T-35) considers, among other things, the cost coverage of piece-rated and pound-rated mail in determining the appropriate ECR pound rate.

Table 3:
Estimated Test Year Unit Costs for Piece-Rated and Pound-Rated Standard A Mail
(from USPS-I-92)

		REG	ECR	NP	NPECR
All Shapes	< 3.0 oz	$ 0.1431	$ 0.0663	$ 0.1044	$ 0.0641
	> 3.0 oz	$ 0.2547	$ 0.0901	$ 0.2863	$ 0.1205
	< 3.5 oz	$ 0.1452	$ 0.0676	$ 0.1055	$ 0.0652
	> 3.5 oz	$ 0.2816	$ 0.0916	$ 0.3221	$ 0.1286
	average	$ 0.1697	$ 0.0729	$ 0.1148	$ 0.0689
Letters	< 3.0 oz	$ 0.1097	$ 0.0669	$ 0.0909	$ 0.0599
	> 3.0 oz	$ 0.3090	$ 0.1683	$ 0.5151	$ 0.1304
	< 3.5 oz	$ 0.1106	$ 0.0678	$ 0.0911	$ 0.0601
	> 3.5 oz	$ 1.0275	$ 0.2094	$ 0.8650	$ 0.1939
	average	$ 0.1129	$ 0.0685	$ 0.0920	$ 0.0604
Flats	< 3.0 oz	$ 0.2494	$ 0.0639	$ 0.2053	$ 0.0734
	> 3.0 oz	$ 0.1976	$ 0.0866	$ 0.2243	$ 0.1054
	< 3.5 oz	$ 0.2289	$ 0.0656	$ 0.2009	$ 0.0759
	> 3.5 oz	$ 0.2091	$ 0.0889	$ 0.2438	$ 0.1073
	average	$ 0.2205	$ 0.0740	$ 0.2115	$ 0.0815
Parcels	< 3.0 oz	$ 1.3038	$ 0.9441	$ 0.8510	$ 4.4242
	> 3.0 oz	$ 0.7922	$ 0.7083	$ 1.1605	$ 2.0808
	< 3.5 oz	$ 1.2285	$ 0.6948	$ 0.7763	$ 4.8351
	> 3.5 oz	$ 0.7868	$ 1.3067	$ 1.2230	$ 1.9733
	average	$ 0.8385	$ 0.8242	$ 1.0903	$ 2.4946
Flat + Parcel	< 3.0 oz	$ 0.2627	$ 0.0657	$ 0.2108	$ 0.0757
	> 3.0 oz	$ 0.2524	$ 0.0883	$ 0.2773	$ 0.1199
	< 3.5 oz	$ 0.2414	$ 0.0674	$ 0.2066	$ 0.0783
	> 3.5 oz	$ 0.2752	$ 0.0906	$ 0.3099	$ 0.1265
	average	$ 0.2567	$ 0.0757	$ 0.2334	$ 0.0869

VII. RESULTS OF IMPACT OF WEIGHT ON PERIODICALS COSTS

USPS witness Taufique (USPS-T-38) combines Periodicals subclass costs for the purpose of rate design. Therefore, a table of Test Year costs by ounce increment for Regular and Nonprofit Periodicals combined is shown in Table 4a on the next page. Costs have been adjusted for differences in presorting because lighter weight periodicals are less presorted than heavier periodicals. Since lighter weight pieces are less presorted than average, these costs are higher than if they had an average presort profile. Similarly, since heavier pieces are more presorted than average, these costs are lower than if they had an average presort profile. Therefore, not adjusting for presort would tend to understate the impact of weight on costs.[9]

A line has been fit to the TY presort adjusted unit cost estimates in the graph.[10] Using the equation of this line, one can calculate the percentage of Periodicals total costs that are piece-related and pound-related. Dividing the intercept of the equation of the line, 0.175, by the average unit cost of Nonprofit and Regular Periodicals, $0.243, yields the percent of total costs that are piece-related, 72 percent. The remaining 28 percent are pound-related. This is not to imply that pieces and total pounds are the only cost drivers. However, Periodicals rate design generates revenue from per piece elements and per pound elements.

To compare the results of from previous analyses, transportation costs have been removed in Table 4b. The resulting equation implies the percentage of nontransportation costs that are pound-related is 13.4 percent. This figure is similar to the figure of 15 percent witness Madison calculated in Docket No. R84-1.

---

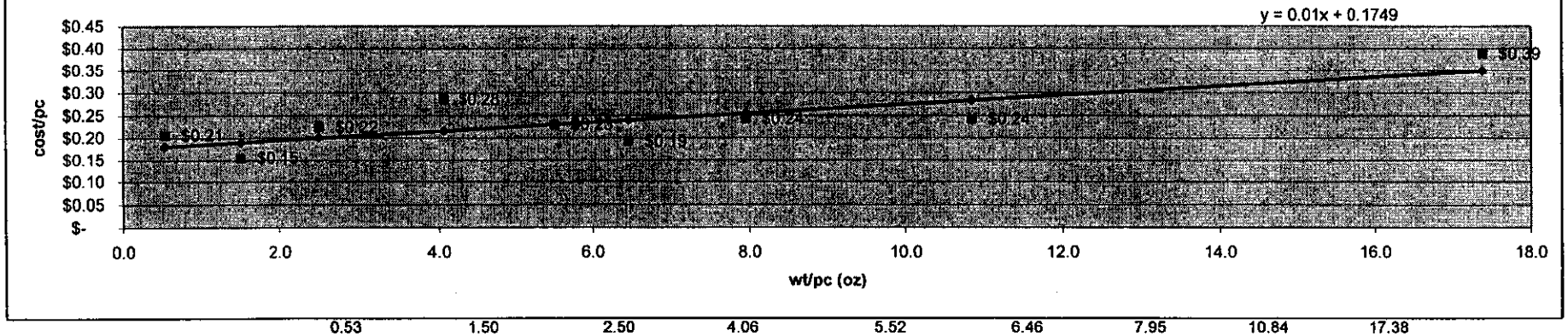
[9] The supporting calculations for the adjustments can be found in USPS LR-I-94 using volume data from USPS LR-I-102.

[10] The SAS program for the regression can be found in USPS LR-I-94, Supporting Calculations for Weight Studies.

Table 4a:
Regular and Nonprofit Periodicals Combined Unit Costs by Weight Increment
(from USPS LR-I-93 detailed costs)

	0 to 1	1 to 2	2 to 3	3 to 5	5 to 6	6 to 7	7 to 9	9 to 13	over 13	Total
volume	305,307,776	1,181,794,928	708,249,040	1,580,510,624	1,090,948,400	1,227,947,432	1,263,819,408	1,260,879,620	1,017,174,849	9,636,632,077
pounds	10,164,259	110,920,188	110,837,240	401,170,461	376,122,743	495,409,643	627,901,276	854,280,596	1,104,906,096	4,091,712,503
cubic feet (weight/density)	561,163	6,623,031	6,732,945	24,518,363	22,989,428	30,277,302	38,373,303	52,213,508	67,768,338	250,057,381
all mp (3.1) tally	43,531	92,106	93,316	258,185	111,023	73,024	129,619	108,149	163,659	1,072,613
window service (3.2) tally	6	1,056	205	1,132	154	362	392	306	144	3,759
delivery in-office (6.1) tally	11,502	26,494	22,182	65,332	29,856	26,221	34,208	27,536	22,449	265,781
delivery in-office (6.2) 6.1	2,248	5,177	4,335	12,767	5,834	5,124	6,685	5,381	4,387	51,938
del. route (7.1) piece	1,333	5,161	3,093	6,902	4,764	5,362	5,519	5,506	4,442	42,083
del. access (7.2) piece	332	1,286	771	1,720	1,188	1,337	1,376	1,372	1,107	10,490
elem. load (7.3)shape&wt	3,195	10,505	5,321	13,021	10,907	14,122	17,877	24,614	43,248	142,810
del. support (7.4) sum6&7	2,990	7,940	5,732	15,895	8,537	8,597	10,779	10,788	13,020	84,279
vehicle service (8) cube	145	1,708	1,737	6,325	5,930	7,810	9,898	13,469	17,481	64,502
delivery rural (10)shape&pc	8,192	27,954	16,227	35,894	24,578	27,617	28,416	28,388	23,302	220,569
air/water trans. (14) weight	71	773	773	2,797	2,623	3,455	4,378	5,957	7,705	28,532
hwy/rail trans. (14)cube	762	8,991	9,140	33,283	31,208	41,101	52,091	70,879	91,994	339,449
Other weight	38	418	417	1,511	1,416	1,866	2,365	3,217	4,161	15,409
Total Cost	74,346	189,570	163,249	454,764	238,019	215,998	303,604	305,564	397,099	2,342,213
Total Unit Cost	$ 0.244	$ 0.160	$ 0.230	$ 0.288	$ 0.218	$ 0.176	$ 0.240	$ 0.242	$ 0.390	$ 0.243
Presort Adj. (USPS LR-I -94)	(0.038)	(0.006)	(0.007)	(0.003)	0.011	0.016	0.002	(0.001)	(0.003)	$ -
Adjusted Unit Cost	$ 0.206	$ 0.154	$ 0.223	$ 0.285	$ 0.229	$ 0.192	$ 0.242	$ 0.241	$ 0.387	$ 0.243
Marginal Cost Difference		$ (0.083)	$ 0.070	$ 0.057	$ (0.070)	$ 0.022	$ 0.066	$ 0.002	$ 0.148	

Presort Adjusted Regular and Nonprofit Periodicals Unit Cost by Ounce Increment



	0.53	1.50	2.50	4.06	5.52	6.46	7.95	10.84	17.38
SAS Equation* y=.0100x+.1749	$ 0.18	$ 0.19	$ 0.20	$ 0.22	$ 0.23	$ 0.24	$ 0.25	$ 0.28	$ 0.35
Total Adjusted Unit Cost	$ 0.21	$ 0.15	$ 0.22	$ 0.28	$ 0.23	$ 0.19	$ 0.24	$ 0.24	$ 0.39

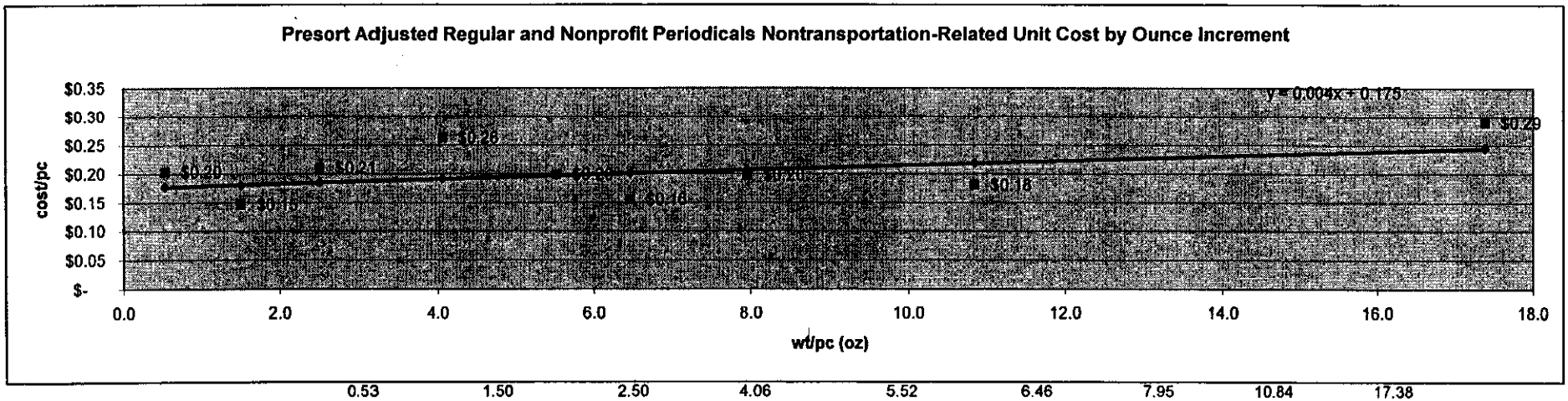
*USPS LR-I-94

average weight per piece (oz)	6.79	total cost implied by equation	$ 2,340,120,951	piece related %	71.96%	=0.1749 * tot vol / CRA Cost
Piece related	72.02% = 0.1749 / y	total cost in CRA	$ 2,342,213,000	pound related %	28.04%	
Pound related	27.98%	difference	$ (2,092,049)			

Table 4b:
Regular and Nonprofit Periodicals Combined Nontransportation Unit Costs by Weight Increment
(from USPS LR-I-93 detailed costs)

volume	305,307,776	1,181,794,928	708,249,040	1,580,510,624	1,090,948,400	1,227,947,432	1,263,819,408	1,260,879,620	1,017,174,849	9,636,632,077
pounds	10,164,259	110,920,188	110,837,240	401,170,461	376,122,743	495,409,643	627,901,276	854,280,596	1,104,906,096	4,091,712,503
cubic feet (weight/density)	561,163	6,623,031	6,732,945	24,518,363	22,989,428	30,277,302	38,373,303	52,213,508	67,768,338	250,057,381
all mp (3.1) tally	43,531	92,106	93,316	258,185	111,023	73,024	129,619	108,149	163,659	1,072,613
window service (3.2) tally	6	1,056	205	1,132	154	362	392	306	144	3,759
delivery in-office (6.1) tally	11,502	26,494	22,182	65,332	29,856	26,221	34,208	27,536	22,449	265,781
delivery in-office (6.2) 6.1	2,248	5,177	4,335	12,767	5,834	5,124	6,685	5,381	4,387	51,938
del. route (7.1) piece	1,333	5,161	3,093	6,902	4,764	5,362	5,519	5,506	4,442	42,083
del. access (7.2) piece	332	1,286	771	1,720	1,188	1,337	1,376	1,372	1,107	10,490
elem. load (7.3)shape&wt	3,195	10,505	5,321	13,021	10,907	14,122	17,877	24,614	43,248	142,810
del. support (7.4) sum6&7	2,990	7,940	5,732	15,895	8,537	8,597	10,779	10,788	13,020	84,279
vehicle service (8) cube	145	1,708	1,737	6,325	5,930	7,810	9,898	13,469	17,481	64,502
delivery rural (10)shape&pc	8,192	27,954	16,227	35,894	24,578	27,617	28,416	28,388	23,302	220,569
air/water trans. (14) weight	71	1,775	778	2,797	2,623	3,455	4,378	5,967	7,705	28,532
hwy/rail trans. (14)cube	762	8,991	9,140	33,283	31,208	41,101	52,091	70,879	91,994	399,449
Other weight	38	418	417	1,511	1,416	1,866	2,365	3,217	4,161	15,409
Total Cost minus transportation	73,513	179,805	153,336	418,683	204,188	171,443	247,135	228,728	297,400	1,974,232
Total Unit Cost	$ 0.241	$ 0.152	$ 0.217	$ 0.265	$ 0.187	$ 0.140	$ 0.196	$ 0.181	$ 0.292	$ 0.205
Presort Adjustment	(0.038)	(0.006)	(0.007)	(0.003)	0.011	0.016	0.002	(0.001)	(0.003)	$ -
Adjusted Unit Cost	$ 0.203	$ 0.146	$ 0.209	$ 0.262	$ 0.198	$ 0.155	$ 0.197	$ 0.180	$ 0.289	$ 0.205
Marginal Cost Difference		$ (0.089)	$ 0.064	$ 0.048	$ (0.078)	$ 0.008	$ 0.042	$ (0.014)	$ 0.111	

Presort Adjusted Regular and Nonprofit Periodicals Nontransportation-Related Unit Cost by Ounce Increment



	0.53	1.50	2.50	4.06	5.52	6.46	7.95	10.84	17.38
SAS Equation y=.0004x+.175	$ 0.18	$ 0.18	$ 0.19	$ 0.19	$ 0.20	$ 0.20	$ 0.21	$ 0.22	$ 0.24
Total Adjusted Unit Cost	$ 0.20	$ 0.15	$ 0.21	$ 0.26	$ 0.20	$ 0.16	$ 0.20	$ 0.18	$ 0.29

average weight per piece (oz)	6.79
Nontransportation Pc-related	86.60% = 0.175 / y
Nontransportation Lb-related	13.40%

VIII. DELIVERY COSTS

Delivery cost differences caused by shape, DPS, and high density and saturation presorting are recognized in the First-Class Mail Presort, Periodicals,[11] and Standard Mail (A) rate designs. This testimony updates the methodology sponsored by witness Hume (USPS-T-18), who estimated these costs in Docket No. R97-1. In lieu of using data from previous field studies, total unit delivery costs by rate category for First-Class Presort and Standard Mail (A) are developed using data from several of the Postal Service's ongoing statistical data cost and volume systems. The data systems used in this analysis include In-Office Cost System (IOCS), City Carrier Cost System (CCS), the Rural Carrier Cost System (RCCS) and RPW. The unit costs developed in this testimony are costs per RPW piece, not costs per cased or delivered piece, because not all pieces are delivered by carriers. The cost of sorting pieces to PO box, for example, are considered mail processing, not delivery costs.

A. C/S 6 In-Office Costs Tally Analysis

Characteristics such as shape, DPS, and high density and saturation presorting can influence city carrier in-office costs. IOCS is used to distribute the cost of city carrier in-office labor to classes of mail in the Base Year. While USPS witness Meehan's (USPS-T-11) BY analysis only computes costs by subclass, IOCS data on shape and endorsements are available to allow costs to be disaggregated to a finer level as described in the sections below.

1. Shape

This section explains how city carrier in-office costs by shape are calculated. Data from LIOCATT System Summary Schedule K&L, Report ALA860P13, found in USPS witness Ramage's (USPS-T-2) Workpaper A show the development of city carrier in-office costs by shape. These data are summarized on page 10 of USPS LR-I-95. The TY city labor in-office costs from cost segment 6.1 in USPS witness Kashani's testimony are distributed to shape using the proportion of costs by shape in the BY on pages 5 through 7 of USPS LR-I-95. Also on pages 5 through 7 of USPS LR-I-95, the TY city in office support costs from cost segment 6.2 in USPS witness Kashani's

---

[11] USPS witness Taufique (USPS-T-38) uses several Standard Mail (A) delivery costs as proxies for Periodicals in his rate design.

testimony are distributed on the basis of costs developed for cost segment 6.1, consistent with the BY methodology employed by witness Meehan.

2. DPS

Because Delivery Point Sequenced (DPSed) letters and cards do not need to be cased, the presence of DPS mail affects city carrier in-office labor costs. The amount of DPS varies by rate category for letters and cards and is estimated by witness Miller (USPS-T-25) in his Attachments I-4, II-2, III-2. This section explains how city carrier in-office costs for letter rate categories are developed.

A similar LIOCATT report[12] from FY93, the Base Year in Docket No. R94-1, and the last year before the rollout of DPS, reports the cost of city carriers handling letters and cards in the office. The unit cost of city carriers handling "non-DPSed" letters and cards in the office can be inflated to the unit cost of handling letters and cards in the TY by using a wage rate adjustment as seen on page 9 of USPS LR-I-95. The cost of handling DPS letters and cards can be estimated by solving for the UNKNOWN in the following equation found on pages 5 through 7 of USPS LR-I-95:

TY LIOCATT SHAPE = %DPS * UNKNOWN + (1-%DPS) * (NON-DPS COST)

Where the variables

- TY LIOCATT SHAPE is theTY cost of letters or cards by subclass
- %DPS is the average TY percent DPS of letters or cards by subclass calculated by witness Miller
- UNKNOWN is the unit cost of DPS letters or cards
- 1-%DPS is the average TY percent of letters or cards by subclass not DPSed
- NON-DPS COST is the TY unit cost of non-DPSed letters and cards calculated on page 9 of USPS LR-I-95

The city carrier in-office cost per rate category is then calculated by weighting the cost of handling DPS mail and non-DPS mail by the relative percent of DPS in each rate category on pages 5 through 7 of USPS LR-I-95.

[12] See LIOCATT System Summary Schedule K&L Report ALA860P19 and ALA860P14 summarized on page 9 of USPS LR-I-95.

3. Walk Sequencing

Customer walk sequencing letters and flats facilitates carrier casing and therefore affects city carrier in-office labor costs. The Standard Mail (A) rate design recognizes this form of worksharing by offering discounts to mailers who prepare walk-sequence saturation or high-density mailings. This mail is required to bear "WSS" or "WSH" endorsements. These endorsements are recorded in IOCS and can be used to allocate city carrier in-office costs to rate category in the same manner as mail processing costs were allocated to rate category by USPS witness McGrane in Docket No. R97-1.

There are several advantages to using IOCS to allocate city carrier in-office costs to carrier route rate categories. First, it eliminates the need to know the extent to which vertical flats cases are being used. Second, using a consistent methodology to allocate mail processing and delivery costs to carrier route rate categories eliminates the need to quantify the percent of carrier route letters which are DPSed by rate category. If basic ECR letters are DPSed in greater proportions than ECR saturation and high density letters, these savings should be imbedded in the costs which are derived from the IOCS data system using the line of travel (LOT), WSS, WSH endorsements on the pieces. Likewise, any additional mail processing due to DPS sequencing should be reflected in the mail processing analysis discussed in Section IX below.

On page 8 of USPS LR-I-95, the costs of ECR flat-shaped and letter-shaped WSS are averaged together. This measure is intended to address situations where a bundle is carried directly to the street. If a carrier route bundle is carried directly to the street without first being cased, it is most likely a *flat-shaped* WSS bundle. Thus, the costs captured by IOCS suppress the in-office cost of WSS flat-shaped pieces, even though letters are actually less expensive to handle in the office, all else equal.

B. C/S 7 Street Costs

City carrier street costs are composed of access, route, load, and support cost segments. These costs segments are analyzed to determine how they vary by rate category. The method by which costs in each of these segments are distributed to rate category is described in the sections below.

1. Cost Segments 7.1, 7.2 and 7.4

As discussed in Section IV.C of this testimony, Cost Segment 7.1, Access Time, and Cost Segment 7.2, Route Time, are assumed to vary by the number of pieces and costs are distributed accordingly. It is assumed that shape, DPS, or walk-sequencing do not affect access or route time. Cost Segment 7.4, Street Support, is assumed to vary by the proportion of costs in Cost Segments 6.1, 6.2, 7.1, 7.2, and 7.3 to be consistent with its treatment in the Base Year.

2. Shape Distribution Key for Cost Segment 7.3, Elemental Load

As discussed in Section IV.C.4 of this testimony, shape is known to affect elemental load costs. For this analysis, costs by shape reported in USPS witness Meehan's City Delivery work papers need to be crosswalked to DMM shape because the volumes by shape recorded in the City Carrier Cost System (CCS) can be based on where mail is physically cased instead of its DMM shape. Using CCS volumes can overstate true volume of DMM-defined letters delivered by city carriers.[13] For example, if a flat or a parcel is cased in the letter case, it may be counted as a letter and is assumed to have the elemental load costs of a letter on the street. Assuming PO Box mail has the same shape distribution as total RPW mail, and using the crosswalked rural volumes described below, the volumes by DMM shape delivered by city carriers can be computed. The unit elemental load cost of letters, flats, and parcels using CCS volumes are first multiplied by CCS volumes by shape. Then, the difference between the DMM volume and the CCS volume is multiplied by the unit letter elemental load cost and added to the first product. The resulting sum is the new total elemental load costs by shape. These costs are used to compute the elemental load distribution key.

Once costs are distributed to shape, they are then distributed on the basis of pieces within each rate category. It is not known how elemental load time may vary by rate categories that have different percentages of DPS or walk sequencing.

C. C/S 10 Rural Delivery Costs

Characteristics such as shape, DPS, and high density and saturation presorting (also known as boxholder mail) can affect rural carrier costs because of the way rural

[13] The volume of ECR letters delivered by rural and city carriers is more than the reported total number of ECR letters in RPW.

carriers are compensated. The manner in which rural carrier costs are developed for First-Class Mail Presort and Standard Mail (A) rate categories is described in the sections below.

1. Shape Distribution Key

Because rural carriers are compensated on the basis of shape definitions that differ from rate category (DMM) shape definitions, the first step in allocating rural carrier costs to shape for the purpose of ratemaking is to crosswalk pieces in each rural compensation category to the appropriate DMM-defined shape. A new study conducted on behalf of USPS Finance Cost Systems by Christensen Associates provides a useful analysis for such a crosswalk. In that study, entitled "Rural Carrier Costing System New Methodology Evaluation," Christensen Associates personnel recorded characteristics of mail just before it was sampled for an RCCS test.[14] The study recorded, by subclass or rate category, the number of pieces in shape categories such as "letters less than or equal to 5 inches high", "DMM letters between 5 inches and 6 1/8 inches high", and "non-caseable flats". This enabled the estimation of the number of DMM-defined letters that are classified as flats for rural carrier compensation purposes. As shown on page 19 of USPS LR-I-95, these data are used to calculate the percentages of total pieces by subclass or rate category for the nine combinations that were recorded.

These percentages are then multiplied by the total number of pieces that the Rural Carrier Cost System (RCCS) estimates are handled by rural carriers for each subclass.[15] These volumes are then multiplied by the BY unit cost by rural compensation category calculated from USPS witness Meehan's USPS-T-11 WP.B Cost Segment 10. Next, these costs are recombined by DMM-defined shape categories to compute a DMM-defined shape distribution key for rural carrier costs.

---

[14] The study was conducted at 35 sites around the country between September and November 1998.
[15] The DMM shape mix for rural compensation categories "Postage Due" and "Letter/Flat Collected" are determined by the DMM shape mix delivered by rural carriers. A similar distribution was performed for First-Class boxholder.

2. DPS

Rural carriers are compensated less for delivering DPSed letters. According to USPS witness Meehan's workpapers (USPS-T-11 WP.B), the cost for a rural carrier to deliver a DPS letter is $.0126 and the cost for a rural carrier to deliver a rural defined letter is $.0326. As an interim step in calculating costs by rate category, the ratio of PERMIT volumes by rate category to total letters in a subclass is multiplied by the cost to deliver DPS and non-DPS letters. These two costs were averaged together using the percent DPSed for each rate category in the TY as estimated by USPS witness Miller (USPS-T-24). These costs are then reconciled back to the total rural carrier costs distributed to letters for that subclass to calculate the amount of rural carrier cost allocated to letter and card rate categories.

D. Resulting Piggybacked Unit Costs

The sum of city carrier costs is multiplied by the appropriate piggyback factor and added to rural piggybacked costs. Costs for the smaller Standard Mail (A) NPECR subclass by rate category were not consistent with the larger ECR subclass, so the costs by rate category for the two carrier route subclasses were averaged together to calculate an average cost avoidance. Costs are then tied back to the TY Costs by shape. A summary of the delivery costs used for by USPS witnesses Fronk (USPS-T-33), Moeller (USPS-T-33), and Taufique (USPS-T-38) for proposed discounts appears in Table 5 on the next page.

Table 5:
Delivery Unit Costs (in cents)
(from USPS LR-I-95)

First-Class Single Piece	
Single-Piece Letters	5.362
Single-Piece Flats	7.427
Single-Piece Parcels	20.025
Single-Piece Nonletters	8.580

First-Class Presort			
NonAuto Presort Letters	5.229		
Auto Basic Letters	4.328	5-D Auto @ DBCS Sites	3.277
Auto 3-Digit Letters	4.233	5-D Auto @ nonDBCS Sites	5.758
Auto 5-Digit Letters	4.078	Presort Letters (Avg)	4.360
Auto CR Letters	5.680		
Presort Flats	9.414		
Presort Parcels	39.751		
Presort Nonletters	10.048		

First-Class Cards			
Single Piece Cards	6.026		
NonAuto Presort Cards	3.905		
Auto Basic Cards	3.233		
Auto 3-Digit Cards	3.162	5-D Auto @ DBCS Sites	2.451
Auto 5-Digit Cards	3.047	5-D Auto @ nonDBCS Sites	4.299
Auto CR Cards	4.240	Presort Cards (Avg)	3.368

Std. A Regular	
Regular Basic Letters	5.157
Regular 3/5 Letters	5.120
Automation Basic Letters	4.674
Automation 3-Digit Letters	4.629
Automation 5-Digit Letters	4.551
Regular Flat Subtotal	7.599
Regular Parcel Subtotal	20.575
Regular Nonletter Subtotal	8.359

Std. A Nonprofit	
Nonprofit Basic Letters	4.122
Nonprofit 3/5 Letters	4.453
Automation Basic Letters	3.376
Automation 3-Digit Letters	3.323
Automation 5-Digit Letters	3.236
Nonprofit Flat	6.641
Nonprofit Parcel	21.217
Nonprofit NonLetters Subtotal	7.004

Std. A ECR			
ECR Basic Auto Letters	4.454		
ECR Basic Letters	5.469	ECR Basic Nonletters	6.591
ECR High Density Letters	4.931	ECR High Density Nonletters	5.069
ECR Saturation Letters	4.019	ECR Saturation Nonletters	4.355

Std. A NECR			
NECR Basic Auto Letters	3.098		
NECR Basic Letters	3.805	NECR Basic Nonletters	4.615
NECR High Density Letters	3.431	NECR High Density Nonletters	3.550
NECR Saturation Letters	2.796	NECR Saturation Nonletters	3.049

IX. ECR AND NECR MAIL PROCESSING COSTS

The Postal Service first calculated mail processing cost savings for Walk Sequence Saturation (WSS)/High Density (WSH) worksharing in the commercial Enhanced Carrier Route (ECR) and Nonprofit Enhanced Carrier Route (NPECR) subclasses using a tally analysis adjusted for dropshipping in my and witness McGrane's testimonies in Docket No. R97-1. This methodology of tally analysis and dropship adjustments, which was adopted by the Commission in its Docket No. R97-1 recommended decision, is employed here as well. As discussed above, delivery costs are developed using a methodology consistent with this accepted approach.

A. Base Year In-Office Tally Analysis

Consistent with USPS witness McGrane's (USPS-ST-44) testimony in Docket No. R97-1, the Base Year mail processing costs for pieces bearing either the WSS or WSH endorsement (which correspond to the carrier route rate categories for saturation or high density, respectively) and basic rate category carrier route tier are calculated. This analysis is performed by analyzing IOCS tallies. Activity codes are created for walk sequence saturation/high density and basic carrier route letters, flats, and parcels. Costs are then distributed to cost pools by activity code using the same methodology employed by USPS witness Van-Ty-Smith (USPS-T-17) to distribute volume-variable costs to shape and subclass. The programs that perform these distributions for MODS, non-MODS, and BMC facilities are documented in USPS LR-I-101, Underlying Cost Data for ECR Mail Processing Studies.

B. Conversion to Reconciled Unit Test Year Piggybacked Costs

The methodology used in USPS LR-I-96, Development of ECR and NPECR Mail Processing Saturation Savings, to convert the Base Year data found in USPS LR-I-101 to Test Year piggybacked data, is the same as that used by USPS witness Smith (USPS-T-21) to produce TY piggybacked costs by shape. This procedure is discussed generally in Section II.A.2 of this testimony. These costs are unitized with TY volumes by shape and rate category found in USPS LR-I-102.[16]

---

[16] Base Year 1998 PERMIT volumes by shape shown in USPS LR-I-102 Tables 14 and 17 are converted to Test Year volumes using a subclass TY to BY ratio.

C. Adjustments

Because (i) saturation and high density rate category mailings are dropshipped in greater proportions than basic rate category mailings and (ii) flats are dropshipped in greater proportions than letters, the effects of non-transportation-related dropship savings need to be removed to better isolate the mail processing savings from more finely presorted, denser mailings. This testimony employs the same methodology used in Exhibit USPS-29D in Docket No. R97-1 to isolate the effects of more finely presorted and denser mailings. Specifically, costs per pound for non-transportation savings calculated by USPS witness Crum (USPS-T-21) are multiplied by the pounds by shape and rate category entered at each destination (Origin, DBMC, DSCF and DDU) as reported in FY98 Billing Determinants (USPS LR-I-125) to compute the total average dropship savings per piece. These dropship savings are added to the mail processing costs on page 17 of USPS LR-I-96 so that the effect of finer depth of sort can be calculated in the absence of dropshipping.

The resulting mail processing costs of nondropshipped saturation/high density and basic carrier route mailings for ECR and NPECR are summarized in Table 6 below. These results are combined with the delivery costs calculated in Section VIII of my testimony and are used by USPS witness Moeller (USPS-T-35). The combined mail processing and delivery costs for Standard Mail (A) ECR and NPECR are shown in Table 7 on the next page.

Table 6:
Summary of Standard A Mail Processing Costs Used for Discounts

	ECR	NPECR
Auto Basic Letters	1.879	1.925
Basic Letters	2.071	4.734
High Density/Saturation Letters	0.762	0.209
Basic Nonletters	2.739	5.092
High Density/Saturation Nonletters	0.904	0.779

Table 7:
Summary of Mail Processing and Delivery Costs for Standard (A) ECR and NPECR Mail Used for Discounts

Standard (A) Regular ECR Unit Cost Estimates (for discounts)

	MP + D Costs	Mail Processing Costs	Delivery Costs
Letters	(rounded)	(rounded)	(rounded)
Enhanced Carrier Route			
Auto Basic	6.333	1.879	4.454
Basic	7.540	2.071	5.469
High Density	5.693	0.762	4.931
Saturation	4.781	0.762	4.019
Nonletters			
Enhanced Carrier Route			
Basic	9.330	2.739	6.591
High Density	5.973	0.904	5.069
Saturation	5.259	0.904	4.355

Standard (A) Nonprofit ECR Unit Cost Estimates (for discounts)

	MP + D Costs	Mail Processing Costs	Delivery Costs
Letters	(rounded)	(rounded)	(rounded)
Nonprofit Enhanced Carrier Route			
Auto Basic	5.023	1.925	3.098
Basic	8.539	4.734	3.805
High Density	3.640	0.209	3.431
Saturation	3.005	0.209	2.796
Nonletters			
Nonprofit Enhanced Carrier Route			
Basic	9.707	5.092	4.615
High Density	4.329	0.779	3.550
Saturation	3.828	0.779	3.049

Mail Processing Costs from USPS-T-28 Table 6
Delivery Costs from USPS-T-28 Table 5

X. SPECIAL HANDLING COSTS

The Cost and Revenue Analysis (CRA) Report has historically reported Special Handling costs. According to the Base Year CRA (USPS-T-11), volume-variable costs of Special Handling totaled $2,221,000. According to FY98 Billing Determinants (USPS LR-I-125), there were 38,649 Special Handling transactions. Therefore, the measured unit cost of a Special Handling transaction is over $57. In the FY97 CRA,[17] Special Handling volume-variable cost was $1,298,000 and there were 125,016 Special Handling transactions reported in the FY97 Billing Determinants, for a cost per transaction of approximately $10. In the FY96 Base Year in Docket No. R97-1 (USPS-T-5), Special Handling volume-variable cost was $1,136,000, and there were 81,960 Special Handling transactions reported in the FY96 Billing Determinants, for a cost per transaction of almost $14.

A. CRA Costs and Encirclement Rules

The CRA reports costs for Special Handling only in mail processing and window service related cost segments using data from IOCS. No costs are reported for delivery, vehicle service drivers, or transportation because these costs are not caused by the Special Handling service, but instead are part of the "normal feature" of the underlying host piece. The "normal feature" cost of a special service piece is the cost that would have been caused by the piece had it been entered without the special service. Tallies where the Special Handling endorsement appears are screened to determine whether the tally should receive an activity code corresponding to the special service or the subclass of the underlying mail piece in "encirclement rules." A detailed description of the FY98 encirclement rules is contained in Appendix E of USPS LR-I-12. Additional discussion of "encirclement rules" is included in Van-Ty-Smith's (USPS-T-17) testimony. Therefore, in theory, the CRA should be able to track those costs only due to Special Handling. However, there are only 2 tallies with "encircled" Special Handling activity codes in FY98. This is not enough data to form a reliable estimate of Special Handling costs.

---

[17] The FY97 CRA (USPS Method) used lower variabilities than they BY98 CRA.

B. Transactions

The variation in the unit cost of Special Handling is magnified by the small number of transactions. The number of transactions of Special Handling declined to an unprecedented low in FY98 making it especially difficult to track costs and volumes with a meaningful level of precision. Since Docket No. R97-1, Special Handling is available for Priority Mail, and it is believed that this will lead to additional transactions, thereby enhancing the reliability of cost and volume estimates in future CRA reports.

C. Field Observations

Because the CRA costs for the BY appear to be questionable, the Postal Service considered whether a special study could be designed to quantify the costs of Special Handling. Field observations revealed, however, that it would be difficult to measure Special Handling costs through a special study. For example, supervisors pay special attention to ensure that articles containing items such as live animals arrive at their destinations as expeditiously as possible and try to minimize the animals' exposure to the elements. In addition, boxes of live animals remain segregated from the rest of the mail stream and tend to utilize more space in postal containers to avoid crushing the parcels. Certainly, these measures are more costly, but extremely difficult to quantify. Thus, based on field observations of operations, the BY98 CRA estimate of $57 per Special Handling transaction overstates the actual volume-variable unit cost due to the special service.

XI. ROLL FORWARD FINAL ADJUSTMENTS

This last section of testimony describes the need for, and calculation of, final adjustments that are added to the total costs by subclass calculated by witness Kashani in the roll forward process. These adjustments are made because the TY costs in USPS witness Kashani's testimony reflect the BY costs rolled forward at TY volumes *but retain the underlying BY mix of volumes.* The volume forecast presented in USPS witness Tolley's testimony (USPS-T-6) shows that the mail mix changes over time. These changes are due to in part to mail migrating to more heavily "workshared" categories, such as mail moving from non-automation to automation categories. The changes may also be a result of classification changes, such as the change in the

break point between First-Class Mail Letters and Sealed Parcels and Priority Mail subclasses from 11 ounces to 13 ounces.[18] Changes introduced in conjunction with Docket No. R97-1 would not, however, be reflected in witness Kashani's rollforward because they occurred after the conclusion of the BY.

The adjustments have cost consequences. Specifically, changes in the volume mix can either increase or decrease the actual total cost of a subclass. For instance, a more heavily workshared mix results in lower costs for many of the major cost segments while a heavier mix of First-Class Mail results in higher costs for all the major cost segments. The effect of the volume mix changes is computed for each interim year (FY99 and FY00) and for the Test Year Before Rates (TYBR) and Test Year After Rates (TYAR). A summary of the final adjustments calculated in USPS LR-I-97 can be found in Table 8 on the next page.

[18] USPS witness Thress (USPS-T-7) also estimates the change in the number of additional ounces due to a trend of heavier First-Class Mail Single-Piece mail on page 5 of his WP4.

Table 8:
Summary of Final Adjustments
(from USPS LR-I-97)

	FY99	FY00	BR01	AR01
	(in millions)			
First-Class Single Piece	$ 43.850	$ 143.482	$ 182.437	$ 183.926
First-Class Presort	$ (51.159)	$ (121.518)	$ (176.972)	$ (201.209)
First-Class Presort Cards	$ (0.123)	$ (1.808)	$ (3.841)	$ (3.882)
Priority	$ 19.939	$ 45.413	$ 50.075	$ 46.127
Standard (A) Regular	$ (194.718)	$ (269.692)	$ (313.298)	$ (313.716)
Standard (A) ECR	$ 2.395	$ 12.638	$ 13.525	$ 12.949
Standard (A) Nonprofit	$ (6.016)	$ (20.943)	$ (28.249)	$ (24.547)
Standard (A) NPECR	$ 5.741	$ 6.716	$ 6.686	$ 6.547
Parcel Post			$ (26.681)	$ (40.604)
Total	$ (180.091)	$ (205.714)	$ (296.318)	$ (334.408)

The results of special cost studies provide a basis for recognizing the change in unit costs as the mail mix changes. Because the changes in mail mix are in the short term (1998 to 2001), long-term volume variable piggybacked costs are not included in the analysis. Since costs such as supervisors are expected to vary with direct labor costs in the short term, USPS witness Smith (USPS-T-21) develops special piggyback factors for this analysis in USPS LR-I-77. As was done in Docket No. R97-1, window service, transportation and vehicle service costs are assumed to be the same for mail migrating from ECR and NPECR Basic Letters to Automation 5-Digit. Supporting cost models used in the final adjustment calculations can be found in USPS LR-I-98. This library reference includes:

- direct labor mail processing unit costs by shape (using USPS witness Smith's methodology (USPS-T-21));
- direct labor mail processing unit costs by rate category for First-Class Mail Presort letters and cards and Standard Mail (A) Regular and Nonprofit letters (using USPS witness Miller's models (USPS-T-24));
- direct labor mail processing unit costs for First-Class Mail Presort flats and Standard Mail (A) Regular and Nonprofit flats (using USPS witness Yacobucci's models (USPS-T-25));
- direct labor mail processing unit costs for Parcel Post as well as transportation and vehicle service driver costs (using USPS witness Eggleston's models (USPS-T-26));
- specially piggybacked mail processing unit costs by rate category for Standard Mail (A) ECR and NPECR (using the models found in USPS LR-I-96);
- specially piggybacked city and rural delivery unit costs (using the model found in USPS LR-I-95);
- specially piggybacked mail processing, delivery, window, vehicle service and transportation unit costs for 12-13 ounce First-Class Mail Single-Piece, heavier First-Class Mail Single-Piece migrating from Standard Mail (A) Single-Piece, and more First-Class Mail Single-Piece additional ounces (using the model found in USPS LR-I-91);

- specially piggybacked costs by shape for First-Class Mail Presort and Standard Mail (A) for window, vehicle service and transportation (using data from weight studies models found in USPS LR-I-91 and USPS LR-I-92); and
- estimated transportation costs for 12-13 ounce Priority Mail pieces using BY data.

To compute the TYBR final adjustment, the calculations in USPS LR-I-97 begin by piggybacking TYBR mail processing, window service, city carriers, vehicle service, and rural carriers costs from USPS witness Kashani's C Report (USPS-T-14). These costs are compared to the average of piggybacked special study rate category costs weighted by the BY volume mix. The special study results are multiplied by this ratio so they exactly tie back to the TYBR costs. These reconciled unit costs are then multiplied by the TYBR volumes by rate category. The TYBR cost in the rollforward are subtracted from the sum of these costs to compute the TYBR final adjustment. To compute final adjustments for FY99, FY00, and TYAR, the procedure is repeated by tying back to FY99, FY00 and TYAR costs and multiplying by those volumes.